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ABSTRACT

The purpose of this study was to determine whether the use of an interactive multimedia exhibit is more effective than a traditional hands-on exhibit in teaching physical science in a museum setting. The Simple Machine exhibit, a permanent display at the East Tennessee Discovery Center, was used as a comparison with an interactive computer exhibit. Elementary school students (N=104) took a multiple-choice quiz before entering into the museum and again after interacting with the exhibits. A random sample was selected in order to determine whether the students would experience the traditional or the multimedia exhibit. Results indicate that there is an increase in science learning when students interact with a multimedia exhibit when compared to the hands-on exhibit. Also, there appears to be no significant difference in the holding power of the exhibits. Both exhibits were very efficient in attracting and engaging students, and statistical tests indicate no gender differences in learning or in holding power. (Contains 33 references.) (DDR)

Increased Learning of Physical Science Concepts Via Multimedia Exhibit Compared to Hands-on Exhibit in a Science Museum

by

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Abstract

The purpose of this study was to determine whether the use of an interactive multimedia exhibit was more effective than a traditional hands-on exhibit in teaching physical science concepts in a museum setting. The Simple Machines exhibit, a permanent display at the East Tennessee Discovery Center, was used as a comparison with an interactive computer exhibit designed by the author. All elementary age students (n=104) took a multiple choice quiz before entry in the museum and again after interacting with the exhibits. A random sample was selected using numbers on tags that designated whether they would explore the traditional hands-on exhibit or the interactive multimedia exhibit. The purpose of giving visitors a quiz on the content of the selected museum exhibits was to verify how much exhibit information was learned during museum visit. The results of the study demonstrated increased learning when students interacted with a multimedia exhibit ($t = 4.976$, $p = .063$) in comparison with a hands-on exhibit ($t = 1.866$, $p = .000$). There was no significant difference in holding power between both exhibits. Moreover, both exhibits were very efficient in attracting and engaging students. The ANOVA test verified no gender differences in learning ($p = .486$) or in holding power ($p = .046$). However with a larger sample the results might exhibit a gender difference in holding power, as previous studies have suggested (Koran, Koran, & Longino, 1986; and Greenfield 1995).

A growing concern over the importance of science education has been a major factor for the popularity of informal education in recent years (Rennie & McClafferty, 1995; and Jones, 1997). Education is not limited to the physical boundaries of school; students learn throughout the year in and out of school in various settings. Learning outside of school plays a vital role in the development of competence in language, reading, science, and other school-related disciplines (Stevenson, Lee, Chen, Stigler, Hsu, & Kitamura, 1990; Morrison, Smith, & Dow-Ehrensberger, 1995; and Korpan, Bisanz, Bisanz, Boehme, & Lynch, 1997). Teachers are extending instruction beyond the classroom to help students become familiar with the history, science, and culture around them. Field trips to museums, libraries, historical sites, zoos, botanical gardens, aquariums, and local business and government offices teach students about relevant events in their lives and communities. Such visits can be exciting ways for students to connect the information acquired from books and classroom activities with the people, places, and events in their hometowns (Finson & Enoch, 1987; Paris, Troop, Henderlong, & Sulfaro, 1994; and Rennie & McClafferty, 1995).

Informal education, particularly museum education, is different from traditional schooling. It is noncompulsory and does not rely on the controls of grades, tests, and legal restrictions that characterize learning in schools. Visitors are free to come and go at will and explore the exhibits at their own speed and according to one's interest (Paris, Troop, Henderlong, & Sulfaro, 1994; and Jones, 1997).

What is unique about a museum compared to a classroom setting? The instructional stimuli differ markedly. For example, in informal learning settings exposure time to the instructional stimuli tends to be much shorter than in the formal classroom setting. In addition, the learner can have direct contact with objects rather than symbolic exposure (e.g., textbook description) (Bitgood, 1988).

The informal setting holds tremendous possibility as a mechanism for enhancing the appeal of science lessons. There are multidimensional opportunities for learning that cater to the tastes and preferences of a greater number of the individual students. The flexibility leaves students room to investigate and attend to what interests them (Jones, 1997). It is specially helpful to students coping with the social incongruity of an educational system based on a second language or an unfamiliar value system. It provides the freedom to learn in more comfortable ways (Lee, Fraad, & Sutman 1995).

The educational potential of science centers is well recognized (Boyd, 1990; Semper, 1990; and Rennie & McClafferty, 1995) although, as some reviewers point out, much of the literature that promotes them is based on little more than anecdotal evidence (Ramey-Gassert, Walberg II, & Walberg, 1990). Relatively little information exists upon which it can be determined whether visitors' experiences in science centers actually result in measurable advances in learning. Research to date has concentrated on gathering demographic data about museum audiences and on exhibits' effectiveness in transmitting information (Hyman, 1976). Both cognitive and affective testing of museum experience are limited because the traditional instructional model employed in pedagogical research in a regular classroom is inadequate to measure the effectiveness of museum experiences (Hyman, 1976; and Ramey-Gassert, Walberg II, & Walberg, 1990).

Through the use of new technological tools, such as multimedia and hands-on exhibits, science educators have created unique opportunities to increase science literacy in museums and other informal facilities. The objective of the study was to verify whether the use of an interactive multimedia exhibit was more effective than a traditional hands-on exhibit to facilitate connections and clarify complex scientific concepts surrounding the use of simple machines in a science museum setting. The results of these visitor studies can be used to modify and enhance exhibit design, and this function of visitor analysis becomes increasingly important as the economic need for scientific literacy increases. If we, as educators, better understand the process by which visitors learn in the informal setting, we can use this knowledge to ensure that more visitors encounter successful learning situations. Exhibits become not only more effective teaching tools, but also become intrinsically more interesting.

Methods

Design of the Study

To evaluate specific display components and techniques, it is necessary to have some objective measure of success. The most commonly used measures in informal settings are "attracting power" (number and kinds of visitors who approach a particular exhibit) and "holding power" (total number of seconds a visitor remains at the exhibit divided by minimum number of seconds "S" necessary to read and see the exhibit) (Borum, 1977). These are presumed to be indirect measures of interest and understanding. There are obvious problems with such indirect measures. Time spent is not necessarily an indication of interest or of what is learned (Borum, 1977). For this reason, in addition to measuring "attracting power" and "holding power," one must devise a way to test visitors so that the teaching effectiveness, as well as interest stimulation ability, of particular exhibits and the museum as a whole can be measured. The use of cognitive tests have been used extensively with museum visitors. Most efforts at cognitive testing have been conducted to verify visitors' cognitive gain and have focused on school children (Shettel, Butcher, Cotton, Northrup, & Slough, 1968; Screven, 1974; Borum, 1977; and Mary-Lynn, 1990).

Setting

This study was conducted at the East Tennessee Discovery Center, 516 N. Beaman Street, Chilhowee Park, Knoxville, Tennessee 37914. The East Tennessee Discovery Center (approximately 5,000 square feet) is an exciting science center for students of all ages. The Center features hands-on exhibits divided into two open exhibit areas that are divided by the Space Bus exhibit. One particular physical science exhibit, Simple Machines, is a permanent hands-on display at the Center and was used in a comparison with an interactive computer exhibit designed by one of the authors to be integrated within the physical science exhibits.

Subjects

The subjects of the study were composed of elementary school students who visited the East Tennessee Discovery Center between April 1 and July 31 of 1997. Ages of the participants was from 8 to 13 years old. According to the State of Tennessee Curriculum Framework (1995), students learn about simple machines during the third grade. For this reason, the study focused on elementary school students. The study used a large random sample (n=104) so that the possibility of pre-test score influencing the post-test score could be eliminated (Borum, 1977).

In order to participate in the study, according to The University of Tennessee Human Subjects Committee, students needed informed consent from their parents. Because each school visit to the science museum was scheduled far in advance, the researcher contacted the teachers personally. A letter containing a detailed description of the purpose of the study was mailed to the teachers with the request forms for informed consent for each student.

When arriving at the East Tennessee Discovery Center, each subject received a designated number. Each school group in the museum entrance hall took a multiple choice pre-test quiz on simple machines before their visit to the museum and a multiple choice post-test quiz after their visit. The purpose of giving visitors a quiz on the content of the selected museum exhibits was to verify how much exhibit information was learned during the visit. Following the pre-test, random sample was selected using the numbers assigned on the tags to explore either the traditional hands-on exhibit or the interactive multimedia computer exhibit. While the subjects were interacting with the exhibits, the researchers completed a data sheet and timed each subject using a stop watch to accurately collect the data ("attracting power" and "holding power").

Results

The results of the study demonstrated that the use of an interactive multimedia exhibit was more effective than a traditional hands-on exhibit to teach and clarify a specific science concept in a science museum setting. The physical science concept of simple machines was the subject of the study.

Knowledge Gain

The two independent samples paired t-test (Table 1) revealed a significant difference ($t = 2.239$, $p = .027$) in test score improvement using the multimedia method over the hands-on method.

Table 1. Two Independent Samples T-Test: Difference Between the Amount Learned in the Multimedia and Hands-on Methods.

t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Mean Lower	95% Confidence Interval of the Mean Upper
2.239	102	**.027**	9.4231	4.2090	1.0745	17.7717

The paired sample t-test (Table 2) made it possible to verify that the multimedia score improvement was significantly larger than zero, while the hands-on score improvement was not significantly larger than zero. Students learned more about simple machines when interacting with the multimedia exhibit ($t = 4.976$, $p = .063$) than the hands-on exhibit ($t = 1.866$, $p = .000$). Indicating that the multimedia method was more effective in teaching the physical science concept of simple machines. The pre-test group served as a control sample showing how much information visitors already knew about simple machines (Table 3).

Table 2. Paired Sample T-Test: Amount of Improvement of the Knowledge Gain in Test Score.

Experimental Group	Mean (pos - pre-score)	Std. Deviation	Std. Error Mean	t	df	Sig. (2-tailed)
Multimedia	15.0000	21.7382	3.0145	**4.976**	51	**.000**
Hands-on	5.5769	21.1821	2.9374	**1.899**	51	**.063**

Table 3. Mean Percentage of Students Pre-Test and Post-Test Correct Answers to the Knowledge Gain Multiple Choice Test.

Experimental Group	**N**	**Pre-Test Mean Percentage of Correct Answers**	**Post-Test Mean Percentage of Correct Answers**	**Difference Between Post-Test and Pre-Test**
Multimedia	52	50.8	65.8	**15.0**
Hands-on	52	62.1	67.7	**5.6**
Total	**104**	**56.5**	**66.8**	**10.3**

The results supported the study's hypothesis that in a science museum setting, there is increased learning of a physical science concept when students interact with a multimedia exhibit in comparison to a hands-on exhibit. These results therefore sustained Balling's and Falk's (1981) notion that significant cognitive learning does occur through interactive computer experience during museum visits.

Research has shown that knowledge gain is related to exhibit type. As an exhibit becomes more participatory, increases the number of senses, or includes reinforcement, knowledge gain increases. As exhibits become more concrete than abstract, the greater the probability of knowledge gain (Shettel, 1973, and Solomon, 1979). According to Dandridge (1966), changes to the environmental and mentally stimulating conditions causes can be either conducive or adverse to learning. For example, peaceful surroundings in a school are more conducive to the function of learning than an environment of noise and distractions. The multimedia exhibit was located in a more isolated area of the science center-- Kidspace-- resulting in a setting where the conditions were ideal for students to make full use of his/her ability to concentrate and learn.

There appears to be general agreement with the idea that interactive science museums, if properly structured and implemented, constitute a valuable cognitive and effective learning experience for both children and adults by enhancing actual learning and enthusiasm for learning (Shettel, 1973; Solomon, 1979; and Greenfield, 1995). Whether these functions are accomplished equally for females and males is another question, especially in light of studies showing that in general girls and boys do not receive equal experiences in or out of school (Greenfield, 1995).

The study's data (Table 4), although not significant with this number of subjects, exhibited a possible gender difference between the mean score of correct answers to the knowledge gain pre- and post-visit tests. The score differences on both exhibits were slightly higher for females ($x_{multimedia} = 15.7$, $x_{hands\text{-}on} = 9.0$) than for males ($x_{multimedia} = 13.7$, $x_{hands\text{-}on} = 0.9$).

Table 4. Mean Percentage of Correct Answers to the Knowledge Gain Multiple Choice Test.

Experimental Group	Gender	N	Pre-Test Mean Percentage of Correct Answers	Post-Test Mean Percentage of Correct Answers	Difference Between Post- and Pre-Test
Multimedia	Female	33	47.9	63.6	15.7
Hands-on	Female	30	61.3	70.3	9.0
Total	**Female**	**63**	**54.6**	**70.0**	**15.4**
Multimedia	Male	19	55.8	69.5	13.7
Hands-on	Male	21	62.4	63.3	0.9
Total	**Male**	**41**	**59.1**	**66.4**	**7.3**

According to the ANOVA test (Table 5), this difference wasn't statistically significant (p = .486), confirming that there was no gender differences in learning the concept of simple machines.

Table 5. ANOVA Test for Gender and Exhibit Differences in Holding Power.

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	3191.362a	3	1063.787	2.308	.081
Intercept	9574.992	1	9574.992	20.770	.000
Exhibit	2359.141	1	2359.141	5.117	.026
Sex	638.826	1	638.826	1.386	.242
Exhibit* Sex	223.907	1	223.907	.486	**.486**
Error	46099.984	100	461.000		
Total	60300.000	104			

a. R Squared = .065 (Adjusted R Squared = .037)

Holding Power

Holding Power is represented as the total number of seconds a visitor remains at the exhibit divided by the minimum number of seconds "S" necessary to read and see the exhibit (Kool, 1986). There was no significant differences in holding power between both exhibits. Although the results indicated a possible gender difference in holding power; females seemed to spend more time interacting with the hands-on exhibit, and males seemed to spend more time at the multimedia (Table 6).

Table 6. Holding Power for the Experimental Exhibit Types Based on the Mean Length of Stop in Seconds.

Exhibit Type	Gender	N	Mean Length of Stop (seconds)	Holding Power (seconds *)
Multimedia	Male	19	237.9	1.0
Multimedia	Female	33	201.9	0.8
Hands-on	Male	21	116.0	0.8
Hands-on	Female	30	140.4	1.0

*Minimum number of seconds (T) necessary to read and see the exhibit: $S_{Multimedia}$=240 seconds & $S_{Hands-on}$=140 seconds.

The ANOVA test (Table 7) showed that the differences in holding power between both exhibits were not statistically significant (p = .213). However, there was a possibility of an interaction between gender and holding power (p = .046), but it wasn't strong enough in the sample. Further studies should consider a larger sample in order to verify the occurrence of gender difference in holding power in science museum settings.

Table 7. ANOVA Test for Experimental Exhibit Types Holding Power.

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	.587 a	3	.196	1.522	**.213**
Intercept	84.720	1	84.720	658.623	.000
Exhibit	7.914E-03	1	7.914E-03	.062	.805
Sex	4.648E-04	1	4.648E-04	.004	.952
Exhibit* Sex	.525	1	.525	4.082	**.046**
Error	12.863	1	.129		
Total	101.613	104			

a. R Squared = .065 (Adjusted R Squared = .037)

Attraction Power

Attracting Power is the number and kinds of visitors who approach a particular exhibit (Miles et al., 1982). The percentages of attracting power for the multimedia and hands-on exhibit indicated that both exhibits were very effective in attracting observers (Table 8). Although a random sample was selected by using the numbers assigned on the tags to explore either the traditional hands-on exhibit or the interactive multimedia computer exhibit, the students had free will in choosing whether to interact with the exhibits. The researchers' goal was to maximize the ability to document behavior while minimizing the disturbance and distortion of the behavior.

Table 8. Percentage Attracting Power for the Experimental Exhibit Types by Gender.

Exhibit Type	Gender	N	Attracting Power
Multimedia	Male	19	**100%**
Multimedia	Female	33	**100%**
Hands-on	Male	21	**100%**
Hands-on	Female	30	**100%**

Summarizing, the study presented increased learning when students interacted with a multimedia exhibit in comparison with a hands-on exhibit, but both exhibits types were very efficient in attracting and engaging students. The ANOVA test verified no gender differences in learning or in holding power between the two exhibits. Although a larger sample might show results indicating a gender difference, as previous studies have suggested (Koran, Koran, & Longino, 1986, and Greenfield 1995).

Conclusions

Knowledge Gain

The results of the study led to the conclusion that there was a significant difference in test score improvement (knowledge gain) when students interacted with a multimedia exhibit compared to a traditional hands-on exhibit. Students seemed to be more interested when interacting with a multimedia exhibit. They spent time carefully reading the instructions and information available in each screen of the multimedia program. When interacting with the illustrations, animations, and sounds, students clearly expressed excitement, and curiosity. The final result, however, depended on how much information they acquired while navigating the program. In contrast, students who interacted with the hands-on exhibit cared little about reading the instructions and information available at the labels of the exhibit. Some of them began interacting with the pulleys and levers immediately, exhibiting more fun-play behavior rather than trying to find out why it was easier or more difficult to lift bags with the same weight using different pulleys and levers.

The multimedia exhibit created an environment more conducive for learning the specific physical science concept, simple machines, than using only a traditional hands-on exhibit. This was because, as previous research has shown, a good interactive multimedia exhibit involves touching (e.g., mouse pad, touch screen), solving problems, accepting challenges, answering questions, exploring ideas, and making predictions, thereby creating a motivating and conducive environment in which learning can take place. Furthermore, a multimedia exhibit offers access to information in a wide variety of text, visuals, sounds, and interactive modes to accommodate different ages, vocabularies, knowledge, interests, and learning styles. The multimedia exhibit provides a range of engaging experiences that are rewarding to visitors, making learning experience more fun, more meaningful, and more relevant (Borum, 1984; Klevans, 1990; Flagg, 1991; Screven, 1992; and Greenfield, 1995).

To carry these findings to a logical conclusion, if the cognitive experience gained by the museum visitor can be linked to the internal and external experiences that occur in everyday living, then the informal kind of learning that is possible in museums is invaluable. It is important to understand how opportunities for learning in museums can be enhanced by appropriate links to other learning environments, as well as ways in which learning in other environments might be enhanced through appropriate links to museums.

Holding Power

There was no difference between the multimedia and hands-on exhibits holding power (total number of seconds a visitor remains at the exhibit divided by the minimum number of seconds "S" necessary to read and see the exhibit). However, the results revealed a possibility of gender difference in holding power. The amount of time spent interacting with the hands-on exhibit seemed greater for females and greater for males with the multimedia exhibit. However, the sample wasn't large enough to confirm the gender difference.

One factor that had an important influence on the holding power of both exhibits was the actual time that each school spent in the East Tennessee Discovery Center. The majority of school groups visiting the Center during the research period had a defined amount of time to spend interacting with the exhibits. Each school group spent an average of 60 minutes in the science center as a whole and probably only 30 minutes or less interacting with the exhibits. Students, time to explore all the exhibits and to participate in the research was limited.

Attraction Power

Students were equally attracted to approach and interact with both simple machines exhibits (multimedia and hands-on). However, the fact that a random sample was selected to explore either the traditional hands-on exhibit or the multimedia computer exhibit may have influenced the attraction power of the exhibits (number and kinds of visitors who approached a particular exhibit). The use of random by assigned numbers probably restricted the students to use of free will to choose the exhibit with which they wanted to interact. Consequently, any difference in the kinds of visitors, such as gender, that interacted with both exhibits is not shown, although research has clearly shown that there are gender differences in attraction power. Greenfield (1995), in her research on sex differences in science museum exhibit attraction, found that boys were more likely to interact with computers and exhibits illustrating physical science principles while girls would interact more with puzzles and hands-on exhibits focusing on the human body. However, by using randomly assigned numbers the researchers increased the possibility to obtain a representative sample to interact with both exhibits because each school group had a limited time in the exhibit halls of the science center.

Implications for Further Studies

The findings of the study suggest several implications for museum researchers and educators. First, it is very important to continue research on the impact of new technology on learning in informal settings. The development of research techniques, such as the use of large samples to evaluate the possible influence of gender interaction on holding power, attraction power, and learning, is essential to successfully determine the educational value of exhibits and educational programs. The increasing affordability, reliability, and flexibility of computers and video disks are resulting in their proliferation in public museums, zoos, and visitor centers. Emerging technologies have an immense potential for improving the quality and effectiveness of the museum experience.

Second, the social context of a museum visit has a powerful influence on behavior and learning. Interactions between individuals are at least as important for learning as the interactions between the individual and the exhibit (Diamond, 1986; and Blud, 1990). McManus (1988) extensive research led her to conclude that the social aspect of the visit is a fundamental source of satisfaction in museum visits. Peer teaching frequently occurs, with children taking the role of teachers as they question their companions, read labels loud, and demonstrate the way an exhibit works (Gottfried, 1980).

A final implication for making a visit to a science center more beneficial to students is the need to know how to integrate a science center as an adjunct to the science classroom with so that the interactive center becomes, in effect, a giant classroom. Teacher preparation prior to the museum visit is crucial. Teachers need to visit the science center to discover:

- what exhibits are there,
- what concepts or phenomena they demonstrate,
- what level of thought processes are required for them to be understood,
- whether there are worksheets or other cues available,
- how students' movement around the center can be organized, and
- how long the visit should least.

With this information, teachers can determine how to make the visit fit the needs of their current teaching program. One way of accomplishing this would be for teachers to take advantage of the inservise courses many science centers provide to help them plan their visits.

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Guidelines for Presiders/Discussants

(Note: All presiders will also serve as discussants at this year's NARST Annual Meeting)

General Presider/Discussant Roles

- Go to the designated room early. Arrange room furniture to suit the type of session. Check overhead projector and other audiovisual equipment.
- Meet and greet presenters/panel members. Check the pronunciations of names and institutional affiliations.
- Adjust lamps and window shades for desired lighting.
- Leave door open to encourage late arrivals, but close it if necessary.
- Urge audience to sit near the front or to adjust to an optimal seating pattern.
- Start session promptly.
- Adjust overhead projector if not focused or not framed on screen. Turn it off it not in continuous use. Assist with use of other AV equipment.
- Hold presenters/panel members to the agreed time schedule. End the session on time.
- Monitor audience questions. Keep questions brief, civil, and on the topic. Assure fair involvement.
- Interject new ideas and differing viewpoints. Make brief and cogent summary remarks with suggestions for further research.

Specific Presider/Discussant Roles

Paper Sessions

- Read papers before the session.
- Allow 15 minutes for each paper, followed by 5 minutes of questions and responses. This schedule should allow 10 minutes at the end of the session for you to hold a general discussion and review.
- Assist presenters in handing out their papers.
- Notify presenters at 3 minutes remaining, 1 minute remaining, and "time is up." Stand up if necessary.

Symposia

Presentations, discussion, and questioning are controlled by the proposer with the assistance of the presider/discussant (if designated). Discussion should promote the expression of alternative viewpoints and theoretical positions.

Discussion Groups

- Read papers before the session.
- Arrange seats in a circle or other appropriate pattern to facilitate discussion.
- The first author of each paper should give a 5 minute (or less) introduction and summary of his or her research. All presentations should be informal (no audiovisual aides). Most of the session time is devoted to dialogue between presenters and audience.
- Assist presenters in handing out their papers.

Round Tables

In round table sessions, each panel member makes a short, informal presentation followed by discussion which he or she controls. The presider/discussant should facilitate the discussion and give a five-minute warning of the session ending time.

Guidelines for Presenters

General Responsibilities of Presenters at the Meeting

- Go to the designated room early.
- Greet the presider/discussant.
- Check your understanding of overhead projector and other audiovisual equipment prior to the session.
- Stay within the designated time limit.
- Invite audience questions. Answer questions civilly.

Session Formats

Paper Sessions

In a paper session, the presider/discussant introduces the speakers, who then present an abbreviated version of their paper. Generally, papers will be allotted 15 minutes for presentation, followed by 5 minutes of questions, critique, or discussion. The presider/discussant will use any time remaining in the session for additional discussion, general review and suggestions for further research. **A copy of each paper must be disseminated** during or immediately following the session.

Symposia

A symposium usually involves a panel of experts or stakeholders who examine a specific theme or issue. Presentations, discussion, and questioning are controlled by the proposer with the assistance of the presider/discussant (if designated). Discussion should promote the expression of alternative viewpoints and theoretical positions.

Discussion Groups

In a discussion group, the room is arranged to facilitate maximum audience participation. The first author of each paper gives a short (5 minute), informal introduction and summary of his or her research. Most of the remaining session time is devoted to dialogue between presenters and audience. **Each discussion group panel member is expected to disseminate a paper** during or immediately following the session.

Round Tables

In round table sessions, each panel member is assigned a table around which interested persons may gather for discussion with the presenter about his or her topic. The panel member makes a short, informal presentation followed by discussion which he or she controls.

Poster Sessions

In a poster session, authors graphically display materials summarizing their research on the tri-boards provided by the NARST Annual Meeting Program Committee. Authors stand or sit near their boards and hold individualized, informal discussions of the research during the 1.5 hour session time. Presenters must set up their display prior to the start of the session, and then remove it promptly at the end. **Presenters should also have copies of papers or summaries of their research available.** Displays should fit on the boards provided (which are the size of 3 posters), and should include a brief abstract in large typescript.

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